



THE UNIVERSITY *of* EDINBURGH

## Edinburgh Research Explorer

# Climate change, markets and standards: the case of financial accounting

### Citation for published version:

Lovell, H 2014, 'Climate change, markets and standards: the case of financial accounting', *Economy and Society*, vol. 43, no. 2, pp. 260-284. <https://doi.org/10.1080/03085147.2013.812830>

### Digital Object Identifier (DOI):

[10.1080/03085147.2013.812830](https://doi.org/10.1080/03085147.2013.812830)

### Link:

[Link to publication record in Edinburgh Research Explorer](#)

### Document Version:

Peer reviewed version

### Published In:

Economy and Society

### Publisher Rights Statement:

This is an Author's Accepted Manuscript of an article due to be published in Economy and Society by Taylor & Francis (2013)

### General rights

Copyright for the publications made accessible via the Edinburgh Research Explorer is retained by the author(s) and / or other copyright owners and it is a condition of accessing these publications that users recognise and abide by the legal requirements associated with these rights.

### Take down policy

The University of Edinburgh has made every reasonable effort to ensure that Edinburgh Research Explorer content complies with UK legislation. If you believe that the public display of this file breaches copyright please contact [openaccess@ed.ac.uk](mailto:openaccess@ed.ac.uk) providing details, and we will remove access to the work immediately and investigate your claim.



# Climate change, markets and standards: the case of financial accounting

Heather Lovell

School of Geosciences  
University of Edinburgh  
Drummond Street  
Edinburgh, UK  
EH8 9XP

This is the author's final draft as submitted for publication. The final version is due to be published in Economy and Society by Taylor and Francis.

Made available online through Edinburgh Research Explorer

## **Climate change, markets and standards: the case of financial accounting**

### **Abstract**

The paper examines unresolved attempts since 2005 to develop financial accounting standards for greenhouse gas emission allowances. It is a detailed empirical case study into how the large scale experiment of carbon markets has manifested in a particular area of professional expertise - financial accounting. Theories about the role of standards usefully draw attention to the hidden work of standards in society, and help explain why some things are difficult to standardize. However, there are notable gaps in conceptualising how standards are integral to wider processes of policy and technology change. Ideas from governmentality and hybrid markets (*agencements*) are therefore used to further explore the role of standards within markets, and provide a welcome avenue for thinking afresh about the relationship between climate change and standards. [123]

### **Keywords**

Standards; *agencements*; governmentality; climate change; emission allowances; financial accounting.

### **Introduction**

Climate change continues to be an important issue on national and international policy agendas (Lovell, Bulkeley and Owens 2009, Hulme 2008, IPCC 2007, Biermann et al. 2012). A key policy approach to mitigating climate change has been through the construction of markets in which standard units of greenhouse gas emissions are created and exchanged. A fuller understanding of both the potential and the weaknesses of carbon markets requires not just economics (the source of much existing work on them) but also investigation of the implications of carbon markets for other disciplines and professional activities: interdisciplinary work on financial accounting is crucial in this respect, and to date has been somewhat overlooked by researchers in fields other than accounting (Lohmann 2009, Ascui and Lovell 2011, Lovell and MacKenzie 2011, MacKenzie 2009, for exceptions see: Hatherly, Leung

and MacKenzie 2008). In this paper attempts by accountants to classify carbon and set accounting rules for greenhouse gas emission allowances (hereafter ‘emission allowances’) are explored. The empirical analysis, which draws on findings from in-depth interviews with accountants, a survey of European companies, and analysis of the board meetings and 2011 Agenda Consultation of the International Accounting Standards Board (IASB), is of interest both in understanding the detail of how markets such as carbon come into being, as well as providing new insights into the role of standards in markets and in policy change.

Whilst the IASB (the standard setting body of the International Financial Reporting Standards Foundation (IFRS)) might seem at first glance to be a rather mundane, unlikely location for conducting climate change research, its innocuous boardroom in central London belies the importance that decisions taken here have for the operation of carbon markets (and of course other markets and business operations) worldwide. The IASB comprises fifteen full time members (14 men; 1 woman), all highly regarded in the financial and business worlds, whose job is to reach impartial decisions on a wide range of accounting issues, meeting every month for five days. In the world of accounting IASB decisions are carefully monitored and the IASB is paid close attention to: one can register to attend the meetings in person as an observer, or listen to the live webcast, or summary podcasts. For instance, in the May 2012 Board Meeting, amongst other things, the future accounting rules for insurance contracts, leases and macro hedge accounting were all decided upon (IFRS 2012), making this particular London boardroom an important, if slightly unusual, site of empirical research into standard setting.

But why standards? A case is made here for greater consideration of the role of standards in markets and policy making, building on the work of Higgins and Larner (2010), Barry (2006) and Dunn (2008), amongst others. For issues such as climate change, relatively new on the scene, a focus on standards is particularly pertinent because new climate change policies, carbon commodities and ways of measuring greenhouse gas emissions must all somehow fit with standards that already exist, be they in building design, medicine or accounting. The case of carbon accounting demonstrates how in practice this process of making climate change ‘fit’ is a complex,

uncertain and messy process. A focus on standards provides a clear empirical avenue for investigating these kind of complex sociotechnical processes.

The paper also responds to calls for more in depth empirical analysis of how markets come into being and operate (Caliskan and Callon 2010). As carbon markets mature, issues of implementation come increasingly to the fore. Carbon markets cross numerous boundaries (political, financial, professional) and have manifested themselves in different ways in different places, often challenging existing practices (Lovell and Navraj 2013): again, standards provide a useful empirical focus for understanding these changes. It is demonstrated how emission allowances have been a difficult thing for accountants to make a judgement on – an ‘incommensurable’ – and accountants have sought to render emission allowances knowledgeable using a range of techniques and practices, including frequent comparison to other more familiar accounting items (such as government grants, taxes and leases), and, in the absence of international standards, seeking guidance and authority elsewhere (from national accounting organisations, industry bodies, and auditors).

The paper draw on in-depth interviews (#17) with accountants active in carbon financial accounting at a range of different types of organisation, including: large accountancy firms, standard setters (the IASB and its US counterpart - the Financial Accounting Standards Board, FASB), and at large European companies involved in emissions trading. These interviews have been transcribed and coded. The interview material has been supplemented by analysis of IASB Board Meeting minutes, the response letters (#248) to an IASB 2011 Agenda Consultation, as well as a financial report survey. The financial report survey, undertaken in 2010, involved gathering data on the accounting disclosures made in the financial statements of the largest greenhouse gas emitting companies in Europe (#26), in order to ascertain the systems of classification, measurement and reporting followed by the companies (see Lovell et al. 2010 for further detail). The author also sits on the Technical Working Group of an international carbon accounting organisation, and this work, including attending monthly committee meetings and providing expert input to reports and strategy, has informed and provided valuable empirical context.

The paper is structured as follows. First, relevant literature on standards is assessed, interweaved with an analysis of international carbon financial accounting standards since the advent of the European Emissions Trading Scheme (EU ETS) in 2005. The standards literature is rich in empirical detail and discusses issues of classification, standardisation, expertise and commensuration, all of which are highly relevant to the case in hand (Alonso and Starr 1984; Espeland and Stevens 1998). Through a necessarily partial overview of the history of accounting standard setting for emissions trading, it is hoped that a flavour is given of the technical complexity of the financial accounting ambiguities relating to emission allowances. Emission allowance accounting is an area of standard setting that remains in a state of flux, despite repeated attempts to set rules and guidelines. It is noted that there is a substantial literature on the development of voluntary standards, especially environmental and fair trade standards, within scholarship on neoliberalism (Guthman 2007, Mansfield 2007, McCarthy and Prudham 2004). However, these ideas, centred as they are on issues of consumerism and voluntary industry initiatives, although relevant, are less applicable to the mandatory, longstanding, heavily institutionalised rules and principles within financial accounting, and are therefore not discussed in detail here. In the second half of the literature review, theories of hybrid markets (*agencements*) and Foucault's governmentality are introduced in order to expand valuable but underdeveloped ideas within the standards literature. Third, in the main empirical section of the paper it is critically assessed precisely how accountants are seeking to define and understand emission allowances, focusing on the coping strategies they are using in the prolonged absence of an international standard. In conclusion, discussion centres on the value of focusing on standards to research new policy issues such as climate change, because it helps reveal the sociotechnical messiness of adapting existing standards and making new ones. Standards are at work in markets, in government, in business and elsewhere, and understanding their role is important.

### **Standards, financial accounting and emission allowances**

The literature on standards is a natural starting point for thinking about financial accounting simply because first and foremost accounting is an area of activity

structured by a significant and complex array of principles, rules and standards. Theories about standards come from diverse disciplinary origins – from education, accountancy and business studies, science and technology studies and sociology (Cronon 1991, Edwards 2004, Kolk, Levy and Pinkse 2008, Tanaka and Busch 2003, Timmermans and Epstein 2010, Abbatte 1999, Bowker and Star 2000, Higgins and Larner 2010). In this brief review of the standards literature I will concentrate on discussion of standards within science and technology studies (STS) and sociology for two reasons: first, because the empirical cases within this subset of the standards literature have most in common with the complex mix of science, policy and expertise that pervades the case of climate change and financial accounting; and, second, because it is the sociological and STS research on standards that comprise the most developed attempts to date to theorise beyond particular empirical cases, providing the seeds of a wider theoretical framework for standards.

So what has been said about standards? Scholars from sociology and STS have usefully drawn attention to several features of the process of standard setting - a topic that covers new 'things' as well as the continuing operation (inertia) of existing, well-developed standards (albeit with more of a focus on the latter, a point returned to later). First, is identification of a lack of critical academic attention to standards, and a call to take standards more seriously within theories of economy and society (Higgins and Larner 2010). This argument is made particularly forcefully with regard to cases of longstanding, embedded, geographically extensive standards. Bowker and Star (2000), for instance, in their analysis of health service and race classifications argue that these international systems of measurement and classification are typically paid little attention on a day-to-day basis:

"Good, useable systems disappear almost by definition. The easier they are to use, the harder they are to see. As well, most of the time, the bigger they are, the harder they are to see." (Bowker and Star 2000: 33);

and Timmermans and Epstein (2010: 84) in a similar vein caution that:

"Standards and standardization are such widespread and omnipresent features of modernity that, ironically, their precise sociological significance stands at risk of vanishing out of sight."

Financial accounting clearly fits into a category of 'big', stable, international standards: a set of standards that have temporal depth and geographical reach, underpinning economic activity worldwide. However, in line with these arguments about the hidden day-to-day work of standards, the process of setting financial accounting standards is not a topic that has met with great interest by the wider social science community (albeit with some notable exceptions, see Hopwood and Miller 1994, MacKenzie 2008). In common with other types of standards, financial accounting standards use highly expert technical language - largely impenetrable to non-accountants. The IASB, based in London, UK, was established in 1973 (then called the International Accounting Standards Committee, renamed in 2001) and its overall goal is "to develop a single set of high quality, understandable, enforceable and globally accepted financial reporting standards based upon clearly articulated principles." (IASB 2012b). It does this via a series of over fifty interrelated International Financial Reporting Standards (IFRSs), used by over one hundred countries worldwide. The IASB, however, is not the only international financial standard setter – its counterpart in the United States is called the Financial Accounting Standards Board (FASB), and it also has an extensive set of standards, called 'Generally Accepted Accounting Principles' (GAAP), which are used across the United States and beyond.

The second insight provided by scholarship on standards is the useful, detailed analysis of the processes involved in standard setting, in particular the initial acts of classification required. Standardization of new 'things' is always done with reference to what has already been standardized, to the existing body of standards, but at the same time existing standards and classifications are always subject to revision: there is a constant tension between continuity and change. For emission allowances entering the world of financial accounting we have a case of a new thing having to be assessed and made to fit with an existing well-embedded and extensive set of standards, and it is at this stage in the process of setting standards for emission allowances that difficulties have emerged. The theory of finitism provides here one



avenue for understanding classification (Hatherly et al. 2008, Barnes, Bloor and Henry 1996). Finitism is about the relationship between the finite number of existing things (processes, institutions etc) that have already been classified and given meaning and definition, and the infinite number of things in the future that are yet to be classified. The core argument of finitism is that new classifications do not necessarily have to comply with what has gone before, meanings of terms and classifications can and do change, often retrospectively. In other words, what can happen, and often does, is that we go back to earlier classifications and revise them. Finitism has a long philosophical tradition (following Wittgenstein) and the description of it here is a simplification of its interpretation within the sociology of science (see Barnes et al. 1996 for a fuller explanation). The value of finitism to the study of financial accounting, an area of professional practice with its foundation in classification, has been convincingly shown by Hatherly, Leung and Mackenzie (2008). But finitism also sheds light on the more particular issue of carbon financial accounting, for here we have a situation where there is an extensive historical set of international financial accounting classifications (embodied in particular terms, rules, standards) and yet none of them have yet been adjusted for a new accounting item – the emission allowance – despite calls to do so. Finitism therefore raises important questions about the malleability of these existing accounting classifications, and whether their meaning can shift (as finitism suggests) in order to accommodate emission allowances. Whilst carbon financial accounting may seem like a very particular example, there is a wider issue at stake about standards and climate change across a whole range of professional fields – engineering, law, medicine, and so on.

In the run up to the advent of the European Emissions Trading Scheme (the EU ETS) in 2005, accounting guidance was issued by the IASB via its International Financial Reporting Interpretations Committee (IFRIC): *IFRIC Interpretation 3: Emission Rights* ('IFRIC-3') was published in December 2004. IFRIC-3 classified emission allowances as *intangible assets* (whether allocated for free by government, or purchased), therefore falling under International Accounting Standard (IAS) 38. However, accounting for emission allowances required the use of more than one standard as there was the complicating issue of governments (in the early stages of the EU ETS – Phases 1 and 2) giving allowances out for free to companies. This politically-driven free allocation needed to be interpreted with care by financial

accountants. IFRIC-3 ruled that allowances distributed for free should be measured initially at their fair value (i.e. their market price, which at the time of writing stands at around 4 euros per tonne of carbon dioxide, but historically it has been as high as 20 euros per tonne), and that the difference between the amount paid (zero, as issued for free) and fair value should be classified as a government grant and therefore accounted for under IAS 20 ('Government Grants and Disclosure of Government Assistance'). In terms of liabilities, it was judged that a liability should be recognised as emissions are made, and that it should be a 'provision', thus to be accounted for following IAS 37 ('Provisions, Contingent Liabilities and Contingent Assets'), and measured at fair value.

Whilst to non-accountants IFRIC-3 comprises a fairly impenetrable set of recommendations, the detail of this accounting interpretation is relevant in so far as it indicates that for emission allowances the pathway from classification to standardization has not been a smooth one. In part, as noted, this is because of the political decision taken in Europe for governments initially to not make companies pay for emission allowances. But it is also because for some stakeholders carbon accounting raises profound questions about the definitions and principles embodied within the IFRSs (i.e. the overarching financial accounting standards), a point returned to below.

A third important contribution of the literature on standards is that standards are always necessarily sociotechnical (Edwards 2004, Tanaka and Busch 2003, Timmermans and Epstein 2010). Standards do not just involve people, but non-human things (objects, technologies, texts) too:

"Standardization consists of building a society around a standard with an implied script that brings people and things together" (Timmermans and Epstein 2010: 84).

There are obvious overlaps here with STS theories of innovation and change (Coutard 1999, Kemp 1994, Schot, Hoogma and Elzen 1994). Indeed, it is this hybrid mix of the social and the technical which makes the study of standards interesting. Standards are devised by technical experts in the field – whether it be engineers, farmers, plumbers or doctors – these experts have profound knowledge in the particular field

that the standard relates to, but not typically beyond its boundaries. This narrow framing of standard setting expertise is the source of some of the problems in the case of carbon financial accounting: carbon markets are not a topic familiar to financial accounting standard setters. Further, standards are an important and illuminating area of study because they are the formal, tangible outcome of what is typically a fraught, politically-charged and lengthily process of detailed discussion and negotiation, as Edwards suggests in his insightful study of global meteorological standards:

“Standards are socially constructed tools: they embody the outcomes of negotiations that are simultaneously technical, social and political in character.” (Edwards 2004: 827).

It is demonstrated in several case studies on standards, on topics as diverse as standardization of rape seed in China to medical classifications of types of death (Bowker and Star 2000, Tanaka and Busch 2003, Busch 2000), that, despite their objective, technical veneer, there is always ambiguity in how standards are made and operationalised and hence there is ample room for politics, difficult choices and power struggles to surface (Barry 2005). For instance, we see the politics of financial accounting standard-setting in relation to emission allowances clearly illustrated via the degree of protest and uproar (within the financial accounting community at least) in the aftermath of the IASB releasing IFRIC-3 (see Bebbington and Larrinaga-Gonzalez 2008, Cook 2009, MacKenzie 2009 for more indepth discussion). The European Financial Advisory Group (EFRAG) issued particularly negative advice, which carried considerable weight, given that the carbon market that prompted IFRIC-3 was based in Europe (the EU ETS) (Bebbington and Larrinaga-Gonzalez 2008). EFRAG’s objections were about accounting mismatches in the IFRIC-3 recommendations, with concern that they would lead to an artificial volatility of company results. In particular there was negative reaction amongst major EU ETS participants (utilities and large industry emitters, those institutions represented by EFRAG) on a number of grounds, including about where to account for carbon (with IFRIC-3 recommending some gains and losses to be reported in the income statement and some in the equity statement, what is known as a ‘mixed presentation model’), and how to balance assets and liabilities (with IFRIC-3 recommending some emission allowances to be measured at cost (ie the price paid for them) and others at fair value

(at the current market value), known as a ‘mixed measurement model’ (MacKenzie 2009, Cook 2009)). In short, the way of classifying and standardizing carbon proposed by the IASB in IFRIC-3 was judged in practice not to be workable by those companies who would have to actually do the accounting: the multiple identities of carbon were not stabilised within IFRIC-3; there were too many ‘overflows’ from this particular framing (Callon 1998), and IFRIC-3 was withdrawn in mid-2005, leaving a gap in international accounting standards for emission allowances.

It was not until 2008 that any work on emissions trading was restarted by the IASB, this time in the form of a joint project with its US counterpart, the Financial Accounting Standards Board (FASB). The IASB-FASB joint Emissions Trading project had a somewhat broader remit than IFRIC-3, in part reflecting the involvement of both organisations, plus a dramatic rise in the number of new and planned carbon markets worldwide at that time (IASB 2008, Point Carbon 2007). The project was therefore not just about the EU ETS but aimed to address the accounting of all tradable emissions rights and obligations arising under any emission trading scheme worldwide. Some progress was made with this project before it was ‘paused’ in 2010 because of a fundamental IASB review of their project load and objectives. The 2010 IASB Strategy Review resulted in the cessation of most of its standard setting projects (in other words, the Emissions Trading project was not singled out for special attention; the Strategy Review was prompted by the 2008 financial crisis, and the role of financial accounting therein). However, the Emissions Trading project has (as of May 2012) been identified as a project where further research is required (IASB 2012c: 13), giving some optimism to those urging the IASB to develop an international standard.

A fourth and final insight of the standards literature, which has strong resonance to the case of emission allowance accounting, is that whilst much of the literature on standards concentrates on the reach and powerful day-to-day operation of existing large bodies of standards (health, weather etc), scholars have suggested that most can be learnt from cases of things that do not fit with these existing standards (what Bowker and Star call ‘incommensurables’, new markets/commodities/things which have trouble being measured, classified and standardised). As Espeland and Stevens (1998: 332; emphasis added) explain "... claims about incommensurables are likely to

arise at the borderlands between institutions, *where what counts as an ideal or normal mode of valuing is uncertain...*”, and further that “Commensuration is noticed most when it creates relations among things that seem fundamentally different.” (pp.316). It is interesting that whilst for Espeland and Stevens the lack of fit with existing classifications implicitly poses a problem, from a finitist perspective this incommensuration is normal and expected.

Before turning to a detailed empirical analysis examining how standard setters and practicing accountants have managed the ongoing uncertainty about emission allowances, and what the effect of it has been so far, we need additional conceptual tools. In this overview of the literature on standards it is clear that many of the empirical findings from non-accountancy studies have relevance for accountancy, and it is helpful to view financial accounting as a well-developed international body of standards. However, there are also things missing from scholarship on standards, especially in terms of conceptualising the role of standards within broader theories of markets and policy change. Whilst there is of course a vast array of theories to choose from in thinking about a wider application of ideas about standards, two theories are pinpointed for brief analysis - hybrid markets and governmentality – building on the scholarship of Barry (2006), Higgins and Lerner (2010), and Busch (2000), amongst others. These two theories are judged to be readily able to strengthen the existing standards literature, as well as benefit themselves from consideration of the largely hidden, stabilising role of standards and processes of standard-setting within markets and policy.

### *Hybrid markets and the role of standards*

The economic sociology literature on hybrid markets, or *agencements*, is relevant to the case of emission allowances and financial accounting because it provides a welcome means of thinking about the role of standards specifically within markets. The term ‘*agencement*’ is used to “... convey the idea of a combination of heterogeneous elements that have been carefully adjusted to one another.” (Callon 2007b: 13). This body of research draws on the STS origins of many of the authors, describing the process of enrolment, stabilisation and ‘making passive’ the multiple objects within markets (Callon 2007a, Hardie and Mackenzie 2007). It is evident that

the work of standards (of all sorts, including financial accounting) could be integral to market stabilisation; aiding stabilisation and thereby allowing markets to properly function. Indeed, Caliskan and Callon (2010) in their enquiry into marketization (the making of markets), specifically identify the process of standardization of commodities as an important topic of research:

"Disentanglement is more stable... when a commodity has undergone specific processes of standardization that transforms it into an entity described in both abstract and precise terms, certified and guaranteed by a series of textual and material devices" (Caliskan and Callon 2010: 8).

Standardization is primarily viewed here as a way of 'pacifying goods' so they are fit for markets, so they remain stable. Standards in this way can be seen as a type of market device, a term coined to denote "the material and discursive assemblages that intervene in the construction of markets" (Muniesa, Millo and Callon 2007: 2).

Another insight of this hybrid markets literature with relevance to carbon financial accounting is about market design requiring a vision for the whole market system in order to function properly (as an *agencement*, a functioning whole). As Mitchell (2008) argues there is no 'pure' economy: all elements of society and the material world are mixed in together within markets, and, using the example of Edison's electrical system (drawing on Thomas Hughes' book 'Networks of Power' (1983)), he makes the case that what was required for Edison's electricity innovations to become widely used were new technical processes and forms of calculation that brought together and co-ordinated the many different aspects of electricity systems: 'electrical, chemical, economic and social' (2008: 1117). Indeed, Mitchell (2008: 1118, emphasis added) goes further to argue that such processes and acts of calculation do not necessarily even have to be accurate, the important thing is that calculation works practically and is integrated within a system:

*"... successful calculative devices are not necessarily those that are most statistically complete or mathematically rigorous. They are those that make it possible to conceive of a network, or market, or national economy, or whatever is being designed, and assist in the practical work of bringing it into being."*

Similar to the notion of market devices, it is possible here to see standards as a type of 'calculative device', essential to the 'practical work' of bringing a new market like carbon into being. According to *agencement* theory, if you do not have a well designed comprehensive market system that encompasses all component parts, including financial accounting, then this leads to 'overflowing' (Callon 1998, Callon and Muniesa 2007). These ideas suggest, therefore, that part of the reason for accountants not agreeing on a financial accounting standard is a failure of carbon markets to be designed comprehensively (i.e. including financial accounting). Indeed, in the numerous histories of the formation of the EU ETS (Bailey and Wilson 2009, see for example Grubb 2002), it is clear that its conception was rather rushed, and subject to much political bargaining; two characteristics which suggest a lack of attention to the long-term day-to-day operation of the EU ETS, and in particular the types of expertise required therein.

#### *Governmentality and the role of standards*

A Foucauldian governmentality approach is a second potentially fruitful lens through which to broaden discussion of standard setting (and associated carbon accounting practices and rule-making), because of Foucault's longstanding interest in how power is expressed and can be identified through day-to-day practices and routine activities (including, for instance, accounting and book-keeping) (Foucault 1991, 2007), and his interest in processes of 'calculation' broadly defined (Lansing 2011, Li 2007).

It is not hard to see how standards (and particularly accounting standards) might fit within governmentality theory (Higgins and Larner 2010), in enabling calculation to take place by shaping issues and things into technical programmes that can be managed, what Li refers to as '*rendering technical*' - a set of practices "concerned with representing 'the domain to be governed as an intelligible field with specifiable limits and particular characteristics... defining boundaries, rendering that within them visible, assembling information about that which is included and devising techniques to mobilize the forces and entities thus revealed.'" (Li 2007: 7; quoting Rose (1999: 52)).

A key benefit of a governmentality lens for developing ideas about standards is its ability to bring together technologies and practices with discourse, viewing these elements of government as fundamentally connected in a two-way relationship. In other words, a governmentality approach posits that carbon financial accounting governance and practice can only be understood through examining the discursive rationale for the IASB in conjunction with its technical standards, as well as the framing and day-to-day operation of carbon markets. Applied to the case of carbon financial accounting, the practical, technical difficulties accountants are experiencing in classifying and managing emission allowances are thus linked to underlying ambiguities and tensions in the policy discourse and operation of carbon markets. Using a governmentality approach, financial accounting standards are transformed from something mundane and mostly hidden, into a set of technologies with the potential ability to effect change in the discourse, framing and even the whole notion of carbon markets.

In summary, in this review of literature I have drawn together three bodies of work - standards, hybrid markets and governmentality - which are demonstrated to have common themes with relevance for understanding carbon financial accounting. With some detail of the history of emission allowance accounting already covered, the paper now turns to consider in more depth how and why emission allowances have proved so difficult to fit into existing accountancy rules and standards, and what the response of accountants has been to a prolonged absence of standards.

### **Coping strategies: how accountants are responding to an absence of international carbon accounting standards**

As noted, issues of financial accounting market practice are invisible to the public (and probably many policy makers), but nonetheless have a significant influence on the fungibility of carbon and the overall effectiveness of carbon markets. In this empirical section I concentrate on how accountants are seeking to resolve ambiguity about how to measure, classify and disclose emission allowances. A number of coping strategies are at work, which I discuss in turn, including: seeking authority elsewhere (ie outwith the IASB); comparison of carbon to other commodities; lobbying the



IASB for standardisation; and reducing disclosure. The analysis provides useful empirical insights into what happens in the absence of international standards (in a place where one might otherwise expect them, such as financial accounting). This is a topic not well covered by existing literature on standards, which, as noted, tend to focus on existing stabilised standards and the emergence and subsequent integration of new ‘things’ (and not typically situations of prolonged non-integration).

### *Seeking authority elsewhere*

There is evidence that practitioner accountants (i.e. those ‘at the coal-face’, doing the day-to-day work of producing company accounts) are looking elsewhere - beyond the IASB - for authority and reassurance about their choice of emission allowance accounting treatment and disclosure. The global accountancy firm Deloitte, in their regular newsletter on IASB decisions ‘IASplus’, in early 2012 made the observation that national standard setters are ‘moving forward on their own’ in the continuing absence of international standards for emission allowance accounting (Deloitte 2012). For instance, the French national accounting standard setter - Autorité des Normes Comptables (ANC) - published in October 2012 a guidance document called ‘Proposals for Accounting of Greenhouse Gas Emission Rights reflecting companies’ business models’ (ANC 2012), setting out in detail its recommended accounting treatment for emission allowances. It advises flexibility for companies to vary their accounting according to whether their emission allowances are held for trading, or to comply with regulation (a so-called ‘economic’ or ‘activity-based’ approach that the IASB does not support). Further, the Australian national accounting body, the AASB, similarly released a Staff Discussion Paper in July 2012, setting out detailed accounting guidance for Australian companies and organisations preparing for new carbon market legislation in Australia (AASB 2012).

In addition to the work of national accounting organisations, industry groups have also developed guidance in sectors where carbon markets have a significant influence, namely the electricity sector and energy utilities. Most notable here in the European context is the accounting guidance produced by the International Energy Accounting Forum (IEAF) – a group of energy industry accountants based in Europe who have produced, and follow, their own set of emission allowance accounting rules (IEAF 2010). Similarly to the French national accounting body guidance, the IEAF

recommends organisations account differently according to whether allowances are held for production (own use) purposes, or for trading.

The role of auditors has also been important in providing advice and guidance in the absence of international standards, as an interviewee explains:

“You will probably find if they [companies] have the same auditor, they will be doing it [the carbon financial accounting] the same way.... most companies will have consulted with their auditors and say, hey, we have got this new commodity, how the heck do we account for this?”

(Interview, Director - Energy and Utilities Group at a large international accountancy firm, November 2008).

Auditors have, in keeping with national and sectoral standards, generally advocated the ‘activity-based’ model of accounting. For example, the accountancy firm KPMG formalised this approach in its carbon accounting guidance (KPMG 2008), advising accountants to follow different accounting rules depending on the type of organisation they are located in (and hence the type of activity being undertaken). The report classifies organisations according to their dominant activity, as: emitters, creators/green energy, trader/aggregators, and investors/consultants.

However, and significantly, this activity-based solution to emission allowance accounting runs contrary to the opinion of the IASB, and lies at the heart of difficulties in resolving the situation. The IASB has stated that it disagrees with any approach that differentiates between production and trading of emission allowances, as the manager at the IASB with responsibility for the emissions trading project (2008-2010) explained in interview:

“I think a lot of [IASB] Board Members would say well, if you have one thing [an emission allowance], to look at it in different ways doesn’t make a lot of sense because if you have two allowances, in an activity-based model you account for one in that direction and the other in that direction. But why are they so different? You can interchange them [the allowances] and well, you can even change your mind. Just

because you said at the outset, well I'm going to trade that instrument, perhaps you might use it later on in your production process?"

The rationale for the IASB's position is that even though emission allowances are used in different ways that this should not be the basis for international accounting standards, because they are still the same thing. In other words, even if emission allowances are classified temporally by 'users' (companies, financial exchanges, traders) for distinctive purposes, they should be treated by accountants consistently in a single, uniform way. This tricky combination of the potential of emission allowances for multiple use and their fungibility lies at the heart of the struggle by accountancy standard setters to agree on a standard. At the root of the problem of stabilising the identity and definition of emission allowances is this question of how to manage their multiple uses: individuals and organisations do legitimately use emission allowances in different ways - to comply with regulation, to voluntarily offset their emissions, to trade and make profits. Indeed, carbon markets such as the EU ETS were precisely designed with this flexibility in mind; the policy discourse of markets versus state-based 'command and control' regulations hinged on giving choice and flexibility to corporations via markets (Kolk et al. 2008, Bailey and Maresh 2009). In practice, however, we observe friction at the intersection of the two *agencements* of financial accounting and carbon markets, where different understandings of, and expectations about, the purpose and identity of emission allowances jostle. The conceptual, principles-based IASB approach sits uneasily with carbon financial accounting 'in the wild' (after Callon 2007b), where practical decisions have had to be made in the prolonged absence (since 2005) of an accounting standard. Hence a diversity of approaches to accounting for emission allowances have emerged in the absence of an international standard, with national and sectoral organisations having taken the lead in producing their own standards. But, contrary to suggestions from the hybrid markets literature about the problem of 'overflows' to successful market operation, the diversity of standards emerging on emission allowance accounting could be viewed as a strength, rather than a problem: expert communities of practice (national/sectoral) are developing standards that fit their needs, allowing at least for some degree of coordination, consultation and learning.

#### *Comparison of carbon to other commodities*

A second response of organisations to a lack of international standards in this area has been to seek authority for their accounting approach through a different route, namely through comparing emission allowances to other commodities or accounting entities where accounting rules have been decided, such as taxes and leases. For example, in a 2009 IASB Board Meeting Discussion Paper (December; Agenda Paper 18 - IASB 2009) a number of points of comparison are made between emissions trading and other accounting issues in order to help guide Board Members in reaching a decision:

“The issue of a government having discretion to subsequently change access to a restricted resource (ie allocation) is not unique to emissions trading schemes. Governments, for example, grant access to restricted resources by, *for example, transferring or allocating airport landing rights, licenses to operate radio or television stations, import licenses or quotas.... airport landing rights are often conditional on the airline continuing to make use of the landing rights. This is not different to an entity’s right to future instalments in an emissions trading scheme that is conditional on an entity continuing its emitting operations.*”

(IASB 2009, Paragraph 31, emphasis added).

In a number of other locations and discussions beyond the IASB the comparison of emission allowances to other commodities similarly takes place. In the 2012 French ANC accounting guidance, for example, it states that:

“[emission allowances] fall outside the definition of intangible assets as, although they are without physical substance, they do not have the features common to known intangible items (such as *fishing quotas, software, taxi licences, reproduction rights*), especially in the context of emission rights requiring payment.” (ANC 2012: 7, emphasis added).

So, whilst it might seem somewhat unusual at first glance (for non-accountancy experts), to draw links between emission allowances and fishing quotas or reproduction rights, to accountants this is a logical and understandable strategy, and indeed in keeping with findings from other studies of standards, where attempts to draw analogies are a key part of the processes of labelling and classification (Espeland and Stevens 1998, Bowker and Star 2000). It is, in essence, a practice-

based response to the ongoing ambiguity, with corporate accountants and practitioners ‘muddling through’ to derive a method of accounting that appears to work for them, by allowing emission allowances to be ‘made passive’, even if it sits uneasily with the IASB’s principles-based approach to accounting standard-setting.

### *Lobbying the IASB*

A third response of accountants and other interested stakeholders to the absence of IASB standards has been to lobby the IASB to put rules in place. Whilst lobbying activity has been somewhat muted (perhaps understandable in the wider context of the global financial crisis in the period 2008-2012, and the associated upheaval in financial accounting), there is evidence of reasonably strong support for the IASB to take action and/or restart its emissions trading project. This comes in the form of responses to an IASB Agenda Consultation Exercise in 2011. Out of the 248 consultation response letters received by the IASB, 38 of these (12%) asked (unprompted) for the IASB to restart its Emissions Trading Schemes (ETS) project and issue guidance on emission allowance accounting. However, 9% of respondents (#23) explicitly said that this project was a low priority, and should not be restarted. Table One illustrates this diverse range of views from the consultation response letters for and against the IASB restarting work on emission allowances. The profound level of disagreement about to what extent an absence of standards is a problem or not is striking. Also notable is that for those against the IASB restarting the ETS project, the majority of concerns relate to the potential for emission allowance accounting to unravel the existing set of international financial accounting standards (IFRSs), with comments such as “it highlights that existing IFRSs are deficient” (AASB, Consultation Letter #237), and that “developing a satisfactory, principle-based IFRS [for emission allowances] may not be possible without considering the underlying IFRSs and conceptual framework.” (Grant Thornton, Consultation Letter #77). These concerns empirically inform theories of finitism and hybrid markets. From a finitist perspective, standards are constantly in a state of flux – change is the norm and existing standards, such as those in international financial accounting, are seen as inherently malleable: from a finitist perspective, therefore, these worries about change (identified through the IASB Agenda Consultation), are misplaced. However, from a hybrid market perspective, financial accounting standards are a valuable market device that provide essential stability, pacifying goods and allowing markets to

function: changing the ‘bedrock’ of financial accounting standards is a big step that has the potential to bring about market instability, and therefore should be resisted.

The official IASB response to the Agenda Consultation identifies the ETS as a ‘priority research project’ (IASB 2012a: 11) (one of only nine such projects), signalling at least some support for developing a standard.

<b>IASB Letter reference #</b>	<b>IASB should prioritise/restart Emission Trading Schemes (ETS) project</b>	<b>IASB Letter reference #</b>	<b>IASB should NOT prioritise/restart Emission Trading Schemes (ETS) project</b>
Int.Public Sector Accounting Standards Board (#CL29)	"we support the IASB reactivating this [ETS] project, given the number of jurisdictions in which ETSs have been implemented and the number of entities affected by such schemes.."	Grant Thornton (#CL77)	"We recognise that these schemes have grown in importance and that applying existing IFRSs is challenging. However, we feel that developing a satisfactory, principle-based IFRS may not be possible without considering the underlying IFRSs and conceptual framework."
Deloitte (#CL43)	“Given the pervasiveness of the issue and the current lack of guidance in IFRSs on dealing with such schemes, there is a considerable risk of divergent practices emerging and of national or regional regulators introducing their own requirements to fill the gap in IFRSs, thus diluting the status of IFRSs as a comprehensive set of financial reporting standards without regional variation. Consequently, we think a narrow-scope project that would achieve consistency in the short-term is necessary. In the	Royal Dutch Shell (#CL165)	"As the Board already knows from its experience with IFRIC 3 and its subsequent research, the accounting for ETS... raises a number of complex conceptual issues and any proposals (for example, by amending IAS 38 to allow emissions allowances to be carried at fair value with changes therein recognised in profit or loss rather than other comprehensive income) would have consequential effects that would most likely cause the project to expand beyond its original remit." .

longer term, we think that the intangibles project [IAS 38] should include ETS within its scope,"

CFA UK – Investment Professional Body (#CL111)	“There is a growing need for guidance on [ETS], especially once allowances are auctioned. Standards on intangibles and inventory seem relevant, so the priority should be to see whether the measurement issue can be solved by applying existing standards.”	EU Round Table of Industria lists (#CL12 7)	“we consider that existing guidance in IAS20 and IAS37 is sufficient to address this issue which should be removed from the agenda"
Ernst and Young Global Ltd (#CL248)	"This is currently a gap in IFRS that is leading to significant diversity in practice and different accounting results...Emission reduction schemes continue to evolve and develop around the globe that means this project will have a more widespread impact on IFRS.. If undertaken, this would be a comprehensive project requiring significant effort by the IASB that also considers the interaction with accounting for government grants and intangibles."	Internati onal Energy Account ing Forum (IEAF) (#CL12 2)	"The IEAF does not believe that it would be necessary for the IASB to give priority to [this] project ...As it is a key topic for our industry we have followed the discussions of the IASB about this topic with great interest. In our opinion, it is of high importance that the accounting model for emission rights fairly presents the economic substance of the business models of the companies. In particular, “artificial” income volatility that is only accounting driven, but does not exist in economic reality because the entity is completely hedged has to be avoided.”
The	“We recognise that ETSs are increasing in importance as	Australi	"whilst the need for a specific project.. seems initially



Hundred Group of Finance Directors (#CL227)	more and more countries seek to meet emissions targets. We therefore believe that the Board should continue with this project. We are mindful that this is likely to be a difficult project... and recognise that it is likely to require considerable resources"	an Account ing Standard s Board (AASB) (#CL23 7)	attractive, the AASB believes it highlights that existing IFRSs are deficient in the sense that they are too narrowly focused. If IFRSs ... were sufficiently broad in scope and sufficiently principle-based, accounting for new topics such as ETS could be determined within the context of those standards. Writing rule-based solutions for each new topic as they arise will add to the complexity of IFRSs and the inconsistencies between them."
---	---	---	---

Table One – Extracts of IASB 2011 Agenda Consultation response letters related to emissions trading.

### *Reducing disclosure*

A fourth and final response of accountants to the lack of international guidance has been, simply, to provide less information in the public domain about their emission allowance accounts. In the absence of international rules there is no formal requirement for organisations to provide emission allowance data in their financial reports, and so many companies consequently have very low levels of disclosure. A survey of carbon financial accounting practices in 2010 found that 69% of companies surveyed did not disclose any information about depreciation of emission allowances, and 23% provided no information about their emission allowance liabilities (Lovell et al. 2010). One accountant describes in interview the process they have been through at his company of gradually reducing emission allowance disclosure:

“At first we wanted to be very transparent, we wanted to disclose everything, yes?... But because we started to have a lot of problems with our auditors we decreased the disclosure... we haven’t changed the accounting scheme, which could have material impact on numbers, but we changed the disclosure... we decreased the disclosure very, very much and now it is, you know, it’s good.”

(Interview, Deputy Head of Accounting at a large European energy utility, May 2010).

Worryingly, this reduction in disclosure is despite these items being material (i.e. financially significant) to company accounts (Lovell et al. 2013), meaning that investors and other stakeholders are not being provided with market-relevant information; curbing the transparency and effectiveness of the EU ETS, and running contrary to the fundamental objective of carbon markets to act as an efficient and transparent means of reducing greenhouse gas emissions.

### **Summary and Conclusions**

Conceptualising carbon accounting potentially cuts across a number of different theories and bodies of research. There is a range of relevant literature to draw upon which offers useful insights into how accountants might be exploring what kind of an entity emission allowances are, how to classify emission allowances, and what

happens in the absence of international standards. An obvious starting point in thinking about financial accountancy - an area of professional expertise somewhat renowned for rules, measurement and classification – is the literature on standards. This modest literature – stemming from STS and sociology – provides much in the way of detailed empirical case studies of standard setting and standardization, ranging from global weather measurement, to electrical voltages and international disease classification. It touches on key themes identified in the empirical case: classification, stability and expertise. Many interesting insights are gained, but, as argued, this literature on standards lacks an overarching theoretical framework, and the paper therefore turns to consider the potential role of standards in two notable strands of social science theory: hybrid markets, and governmentality. These two theories complement existing ideas and empirical studies about the role of standards by providing a deeper conceptualisation of the potential role of standards as market or calculative devices and governmental technologies.

Theories of hybrid markets and market devices provide a means to think about markets not as abstract entities but rather as networks of things, people and institutions that are particular to different places, times and commodities. This local embeddedness of markets poses a challenge for standards, which attempt to harmonise and make things the same across space. This is especially true for financial accounting, where the IASB aims to provide an international set of standards underpinning corporate activity worldwide. By investigating a particular empirical case that has remained stubbornly outside of international financial accounting standards – that of the greenhouse gas emission allowance – and where local and regional standards have begun to emerge, it directs our attention to questions of market stability, and what happens in cases of prolonged non-standardization.

Part of the problem with carbon financial accounting (and the reason for extended delay in coming to a resolution) is the IASB objective of a ‘neat’ solution, i.e. that complies with existing standards, and leaves them unchanged. It is a case study of finitism in action – the malleability (or not) in practice of the existing IFRSs. A finitist approach draws attention to the commonplace occurrence of ambiguity and flexibility in the meaning of terms; a theoretical perspective that should provide reassurance to international accounting standard setters, giving them encouragement

to ‘muddle through’ to reach a compromise standard, following the lead of auditors, as well as national and sector standard setters. From a finitist point of view, change has to take place in standards, change is normal. In the case of carbon financial accounting national and sectoral standard setters have been able to accept this practical approach, and adapt and prepare guidance more readily than international standard setters. Working ‘at the coal face’, the national and sector standard setters concerns have naturally been more centred on market stability than the protection of a set of principles-based, conceptual accounting rules (which nonetheless are central to the identity of the IASB). So this is an empirical case study of finitism – about the malleability (or not) in practice of existing standards – as well as a case study of hybrid markets, because for the functioning of the markets some standards have had to be devised and operationalised by the main practitioners. The geography of these standards is of interest: the IASB with its international scope is held in high esteem, but as national and regional standards gain traction it is as yet unclear how these different geographies of emission allowances standard settings will play out.

Insights from theories of governmentality are useful in a different way in highlighting a possible link between the technical difficulties accountants are experiencing in managing emission allowances and fundamental tensions in the conception and operation of carbon markets. An extensive body of governmentality research has shown that in cases where calculation is hampered that it may in fact indicate a set of more profound difficulties in the wider project and ambitions of government. Carbon markets continue to be the primary international policy mechanism to mitigate climate change, but much of the optimism surrounding their conception and early days of operation has faded (Linacre, Kossoy and Ambrossi 2011, Boyd, Boykoff and Newell 2011). It is in the detailed political economy of carbon markets that key decisions have been taken; but with not all types of expertise at the table. The conception of carbon as a commodity to be traded in markets was not something that financial accounting institutions were part of, and yet nevertheless the carbon commodity has crossed institutional borderlands into financial accounting, in the process revealing much about the assumptions, expertise and knowledge embedded within financial accounting standards, as well as the limitations of carbon markets.

This brings us to a further notable insight from the hybrid markets literature, namely Mitchell's idea that processes of calculation do not necessarily have to be accurate, but something that market participants can follow and that fit with other parts of the system. This idea could usefully be extended to standards. Further, and relatedly, the hybrid markets notion of a centre of calculation has relevance here in revealing an absence of such a centre for carbon financial accounting. Technical expertise is split across the IASB (financial accounting) and the European Commission (carbon markets) and these policy and standard setting organisations – split as they are into distinct roles – have not been able to grasp the breadth and depth of the implications of an absence of international standards in the way that those 'in the wild' – companies, auditors etc – whose work does intersect (in a day-to-day practical way) financial accounting and carbon markets, do comprehend. As noted, it is these organisations that have therefore been the ones developing standards. The absence of a coherent centre of calculation also explains the degree of divergence (Table One) in whether or not the absence of international standards is a problem. Without a single calculative centre there is no coherent discursive framing of the issue, and instead multiple centres (auditors, national standard setters etc) are jostling for attention. Indeed, these are not 'overflows', as such, because there is no established centre.

A case has been made here for greater consideration of the role of standards in markets and policy making, in particular to the work standards do to harmonise practices and activities across space, and how climate change, in manifold ways, gives rise to new things and issues that challenge existing standards. Often discounted as mundane, and typically obscured by technical language, standards such as those in financial accounting are nevertheless essential to understanding the day-to-day operation of carbon markets as well as the implementation of other climate change policies. Climate change is relatively new problem and it causes friction and difficulties because the finite set of historical examples on which classification and standardisation across modern society has been based are of limited utility – climate change was not a problem in the past – and existing standards may hinder rather than help processes of policy and technology change. The case of carbon accounting reveals how making climate change fit is a complex, uncertain and messy sociotechnical process, offering valuable insights and significant scope for additional empirical research across other standard setting arenas. In particular it demonstrates

the possibility of a wider conceptualisation of the complex geography of international standards, considering not just the hidden nature and invisibility of these standards, but also the emergence of regional or local standards (perhaps in competition with one another), and the implications of non-existent standards.

## **Acknowledgements**

Dr Lovell would like to acknowledge the financial support of the UK Nuffield Foundation for a New Career Development Fellowship – *Fungible Carbon* (NCF/35037). The content of the paper is based on empirical research completed under this grant. Thanks to Professor Donald MacKenzie for his insightful comments on an earlier draft, and two anonymous referees who provided very helpful guidance and suggestions. Thanks are also extended to Professor Jan Bebbington, Professor Carlos Larrinaga and Dr Thereza Sales de Aguiar, with whom Dr Lovell has also worked with over the course of her *Fungible Carbon* grant, and on a related project, funded jointly by the ACCA and IETA - *Accounting for Carbon*. Lastly, the generosity of all interviewees and survey participants is much appreciated, as is the encouragement of the Climate Disclosure Standards Board (CDSB), who in many ways have helped shape the content and direction of *Fungible Carbon*.

## **Biographical Note**

Dr Lovell's research interests centre on policy change and technology innovation in response to climate change, intersecting existing bodies of work on environmental policy and science and technology studies. Since 2007 she has been based at the University of Edinburgh, UK. From 2008-2012 she held a Nuffield Foundation New Career Development Fellowship to work on carbon markets and carbon accounting. The project, called *Fungible Carbon*, was in collaboration with Professor Donald MacKenzie at the University of Edinburgh, and examined the tensions in creating a single fungible (i.e. standardised and interchangeable) international unit of carbon.

## Bibliography

- AASB.** (2012). AASB Staff paper – Possible Financial Reporting Implications of the Fixed Price Phase of the Carbon Pricing Mechanism for Emitter Entities Sydney: Australian Accounting Standards Board (AASB).
- Abbatte, J.** (1999). From control to coordination: new governance models for information networks and other large technical systems. In *The Governance of Large Technical Systems London & New York*, ed. O. Coutard, 114-129. London & New York: Routledge.
- ANC.** (2012). Proposals for Accounting of GHG Emission Rights. Paris: Autorite des Normes Comptables (ANC).
- Ascui, F. & H. Lovell** (2011). As frames collide: making sense of carbon accounting. *Accounting, Auditing and Accountability Journal.*, 24 (8), forthcoming.
- Bailey, I. & S. Maresh** (2009). Scales and networks of neoliberal climate governance: the regulatory and territorial logics of European Union emissions trading. *Transactions of the Institute of British Geographers*, 34 (4), 445-461.
- Bailey, I. & G. A. Wilson** (2009). Theorising transitional pathways in response to climate change: technocentrism, ecocentrism and the carbon economy. *Environment and Planning A*, 41, 2324 - 2341
- Barnes, B., D. Bloor & J. Henry.** (1996). *Scientific Knowledge: a Sociological Analysis*. London and Chicago: Athlone and Chicago University Press.
- Barry, A.** (2005). The anti-political economy. In *The Technological Economy*, eds. A. Barry & D. Slater, 84-100. London and New York: Routledge.
- Barry, A.** (2006). Technological Zones. *European Journal of Social Theory*, 9 (2), 239-253.
- Bebbington, J. & C. Larrinaga-Gonzalez** (2008). Carbon Trading: Accounting and Reporting Issues. *European Accounting Review*, 17 (4), 697-717.
- Biermann, F., K. Abbott, Andresen, Bäckstrand, Bernstein, Betsill, Bulkeley, Cashore, Clapp, C. Folke, A. Gupta, J. Gupta, P. M. Haas, A. Jordan, N. Kanie & T. Kluvánková-Oravská** (2012). Navigating the Anthropocene: Improving Earth System Governance. *Science*, 335 (6074), 1306-1307.

- Bowker, G. C. & S. L. Star.** (2000). *Sorting things out: classification and its consequences*. Cambridge, Mass: The MIT Press.
- Boyd, E., M. Boykoff & P. Newell** (2011). The 'New' Carbon Economy: What's New? *Antipode*, 43 (3), 601-611.
- Busch, L.** (2000). The moral economy of grades and standards. *Journal of Rural Studies*, 16, 273-283.
- Caliskan, K. & M. Callon** (2010). Economization, part 2: a research programme for the study of markets. *Economy and Society*, 39 (1), 1-32.
- Callon, M.** (1998). An essay on framing and overflowing: economic externalities revisited by sociology. In *The Laws of the Markets*, ed. M. Callon, 244-269. Oxford: Blackwell.
- Callon, M.** (2007a). An essay on the growing contribution of economic markets to the proliferation of the social. *Theory, Culture and Society*, 24 (7/8), 139-162.
- Callon, M.** (2007b). What does it mean to say that economics is performative? In *Do economists make markets? On the performativity of economics*, eds. D. MacKenzie, F. Muniesa & L. Siu, 311-357. Princeton: Princeton University Press.
- Callon, M. & F. Muniesa.** (2007). Economic experiments and the construction of markets. In *Do Economists Make Markets? On the performativity of economics*, eds. D. MacKenzie, F. Muniesa & L. Siu, 163-189. Princeton, New Jersey: Princeton University Press.
- Cook, A.** (2009). Emission rights: from costless activity to market operations. *Accounting, Organizations and Society*, 34 (3-4), 456-468.
- Coutard, O.** (1999). *The Governance of Large Technical Systems*. London: Routledge.
- Cronon, W.** (1991). *Nature's Metropolis: Chicago and the Great West*. New York: Norton and Company.
- Deloitte.** (2012). Accounting for emission rights an urgent topic for national standard setters. In *IASplus*. London: Deloitte.
- Dunn, E. C.** (2008). Standards and Person-Making in East Central Europe. In *Global Assemblages: Technology, Politics, and Ethics as Anthropological Problems*, eds. A. Ong & S. J. Collier, 173-193. Oxford, UK: Blackwell Publishing Ltd.
- Edwards, P. N.** (2004). 'A Vast Machine': Standards as Social Technology. *Science*, 304 (5672), 827-828.



- Espeland, W. N. & M. L. Stevens** (1998). Commensuration as a social process. *Annual Review of Sociology*, 24, 313-143.
- Foucault, M.** (1991). Governmentality. In *The Foucault Effect: studies in governmentality*, eds. G. Burchell, C. Gordon & P. Miller, 87-104. London: Harvester Wheatsheaf.
- Foucault, M.** (2007). *Security, Territory, Population*. Basingstoke, Hampshire: Palgrave Macmillan.
- Grubb, M. J.** (2002). Britannia waives the rules: The United Kingdom, the European Union and climate change. *New Economy*, 9 (3), 139-142.
- Guthman, J.** (2007). The Polanyian Way? Voluntary food labels as neoliberal governance. *Antipode*, 2007, 456-478.
- Hardie, I. & D. Mackenzie** (2007). Assembling an economic actor: the *agencement* of a Hedge Fund. *The Sociological Review*, 55 (1), 57-80.
- Hatherly, D., D. Leung & D. MacKenzie.** (2008). The finitist accountant. In *Living in a Material World: Economic Sociology Meets Science and Technology Studies*, eds. T. Pinch & R. Swedberg, 131-160. Boston, MA: The MIT Press.
- Higgins, V. & W. Lerner.** (2010). *Calculating the social: Standards and the reconfiguration of governing*. Palgrave Macmillan.
- Hopwood, A. G. & P. Miller.** (1994). Accounting as Social and Institutional Practice. In *Cambridge Series in Management*. Cambridge: Cambridge University Press.
- Hughes, T. P.** (1983). *Networks of Power: Electrification in Western Society 1880-1930*. Maryland: The John Hopkins University Press.
- Hulme, M.** (2008). Geographical work at the boundaries of climate change. *Transactions of the Institute of British Geographers*, 33, 5-11.
- IASB.** (2008). International Accounting Standards Board (IASB) - Information for Observers: Emissions Trading Schemes; Board meeting 20 May 2008. London: International Accounting Standards Board (IASB).
- . (2009). Emissions trading schemes: accounting for the right to future installments. Agenda paper 18. London: International Accounting Standards Board.
- . (2012a). Feedback Statement: Agenda Consultation 2011. London: International Accounting Standards Board (IASB).
- . (2012b). IASB - Who we are and what we do. London.

- . (2012c). IFRS Staff Paper for IASB Meeting May 2012: Agenda Consultation 13B. London: International Accounting Standards Board (IASB).
- IEAF.** (2010). International Energy Accounting Forum IFRS Paper - Accounting for Emission Allowances. Geneva: International Energy Accounting Forum.
- IFRS.** (2012). IASB/FASB Meeting May 2012. Norwalk, US.
- IPCC.** (2007). Climate Change 2007: The Physical Science Basis - Summary for Policymakers. Paris: Intergovernmental Panel on Climate Change (IPCC).
- Kemp, R.** (1994). Technology and the Transition to Environmental Sustainability. *Futures*, 26 (10), 1023-1046.
- Kolk, A., D. Levy & J. Pinkse** (2008). Corporate responses in an emerging climate regime: the institutionalization and commensuration of carbon disclosure. *European Accounting Review*, 17 (4), 719-745.
- KPMG.** (2008). Accounting for carbon: the impact of carbon trading on financial statements. London: KPMG.
- Lansing, D. M.** (2011). Realizing Carbon's Value: Discourse and Calculation in the Production of Carbon Forestry Offsets in Costa Rica. *Antipode*, 43 (3), 731-753.
- Li, T. M.** (2007). *The Will to Improve: governmentality, development, and the practice of politics*. Durham and London: Duke University Press.
- Linacre, N., A. Kossoy & P. Ambrossi.** (2011). State and Trends of the Carbon Market 2011. Washington DC: The World Bank.
- Lohmann, L.** (2009). Toward a different debate in environmental accounting: the cases of carbon and cost-benefit. *Accounting, Organizations and Society*, 34 (3), 499-534.
- Lovell, H., J. Bebbington, C. Larrinaga & T. Sales de Aguiar** (2013). Putting carbon markets into practice: a case study of financial accounting in Europe. *Environment and Planning C*, advance online publication (doi:10.1068/c1275)
- Lovell, H., H. Bulkeley & S. E. Owens** (2009). Converging agendas? Energy and climate change policies in the UK. *Environment and Planning C: Government and Policy*, 27 (1), 90-109.
- Lovell, H. & D. MacKenzie** (2011). Accounting for Carbon: The Role of Accounting Professional Organisations in Governing Climate Change. *Antipode*, 43 (3), 704-730.
- Lovell, H. & S. G. Navraj** (2013). Climate change and the professions: the unexpected places and spaces of carbon markets. *Transactions of the Institute of British Geographers*, forthcoming.

- Lovell, H., T. Sales de Aguiar, J. Bebbington & C. Larringa-Gonzalez.** (2010). Accounting for Carbon - ACCA & IETA Research Report 122. London: The Association of Chartered Certified Accountants (ACCA) and the International Emissions Trading Association (IETA).
- MacKenzie, D.** (2008). Producing Accounts: Finitism, Technology and Rule Following. In *Knowledge as Social Order: Rethinking the Social Theory of Barry Barnes*, ed. M. Mazzotti, 99-117. Aldershot, Hants: Ashgate.
- MacKenzie, D.** (2009). Making Things the Same: Gases, Emission Rights and the Politics of Carbon Markets. *Accounting, Organizations and Society*, 34 (3-4), 440-455
- Mansfield, B.** (2007). Articulation between neoliberal and state-orientated environmental regulation: fisheries privatisation and endangered species protection. *Environment and Planning A*, 39, 1926-1942.
- McCarthy, J. & S. Prudham** (2004). Neoliberal nature and the nature of neoliberalism. *Geoforum*, 35, 275-283.
- Mitchell, T.** (2008). Rethinking economy. *Geoforum*, 39, 1116-1121.
- Muniesa, F., Y. Millo & M. Callon.** (2007). An introduction to market devices. In *Market Devices*, eds. M. Callon, Y. Millo & F. Muniesa, 1-12. Oxford: Blackwell Publishing/The Sociological Review.
- Point Carbon.** (2007). Carbon 2007: a new climate for carbon trading. Point Carbon.
- Schot, J. W., R. Hoogma & B. Elzen** (1994). Strategies for Shifting Technological Systems: the case of the automobile system. *Futures*, 26 (10), 1060-1076.
- Tanaka, K. & L. Busch** (2003). Standardization as a means for globalizing a commodity: the case of rapeseed in China. *Rural Sociology*, 68 (1), 25-45.
- Timmermans, S. & S. Epstein** (2010). A World of Standards but not a Standard World: Toward a Sociology of Standards and Standardization. *Annual Review of Sociology*, 36, 69-89.